Aeolosaurus

Aeolosaurus (/ˌiːoʊloʊˈsɔːrəs/; "Aeolus' lizard") is a genus of titanosaurian sauropod dinosaur from the Late Cretaceous Period of what is now South America. Like most sauropods, it would have been a quadrupedal herbivore with a long neck and tail. *Aeolosaurus* is well known for a titanosaur, as it is represented by the remains of several individuals belonging to at least three species. However, like most titanosaurs, no remains of the skull are known. The holotype of *Aeolosaurus rionegrinus* consists of a series of seven tail vertebrae, as well as parts of both forelimbs and the right hindlimb. It was discovered in the Angostura Colorada Formation in Argentina, which dates from the Campanian stage of the Late Cretaceous, about 83 to 74 million years ago.

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Aeolosaurus

Temporal range: Late Cretaceous

72–66 Ma

Pre€ € O S D C P T J K PgN

Left femur of *A. maximus*

Scientific classification

Kingdom:	Animalia
Phylum:	Chordata
Clade:	Dinosauria
Clade:	Saurischia
Suborder:	†Sauropodomorpha
Clade:	†Sauropoda
Clade:	†Titanosauria
Clade:	†Lithostrotia
Clade:	†Aeolosaurini
Genus:	†*Aeolosaurus* Powell, 1987

Species

- †***A. rionegrinus*** Powell, 1987 (type)
- †***A. colhuehuapensis*** Casal *et al.*, 2007
- †***A. maximus*** Santucci & De Arruba-Campos, 2011

Etymology

This dinosaur is named after the Greek mythological figure Aeolus, Keeper of the Winds in Homer's Odyssey, because of the frequent winds that blow across Patagonia, where the remains were found. The generic name also includes the Greek *sauros* ('lizard'), the traditional suffix used in dinosaur names. The specific name (*A. rionegrinus*), refers to its location, in the Rio Negro Province of Argentina. Both genus and species were named and described by Argentine paleontologist Jaime Powell in 1987.[1]

Provenance

Aeolosaurus is a widespread genus of titanosaur known from the Late Cretaceous of South America. Fossils have been collected from the Allen, Angostura Colorada, Bajo Barreal, and Los Alamitos Formations of Argentina and the Adamantina Formation and Marília Formation of Brazil.[2] All *Aeolosaurus* fossils are from the Campanian and Maastrichtian ages of the Cretaceous period.

History

The type species of *Aeolosaurus*, *Aeolosaurus rionegrinus*, was originally named along with the genus in the doctoral thesis of Jaime E. Powell. However, according to the ICZN, names from dissertations are not valid, so it was not formally named until it was published the following year.[1][3] Powell's thesis was ultimately published in 2003, which is sometimes incorrectly cited as having named the genus.[3][4] In 2004, *Aeolosaurus* and *Gondwanatitan* were recognized as forming a new group of titanosaurs, which was named Aeolosauridae.[5] In 2007, a second species, *A. colhuehuapensis* was named, also from Patagonia.[6] A third species, *A. maximus*, was named in 2011.[2]

Description

Life reconstruction of *Aeolosaurus rionegrinus*

Like all sauropods, *Aeolosaurus* was a large, long-necked, quadrupedal herbivore. *A. rionegrinus* was roughly 14 meters long.[7] *A. rionegrinus* was heavily-built for a titanosaur, with limb bones similar in robustness to those of *Saltasaurus*, whereas *A. maximus* appears to have been more slender.[2]

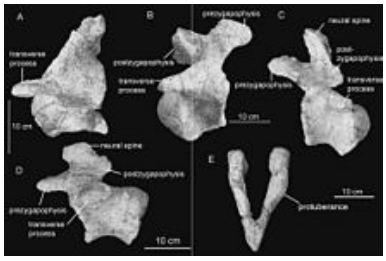
Aeolosaurs, *Aeolosaurus* in particular, have very distinctive caudal vertebrae. The genus *Aeolosaurus* is diagnosed by the shared presence of down-curved prezygapophyses on its anterior caudal vertebrae and chevrons from the anterior and middle portions of the tail with concave posterodorsal surfaces that contain double articular facets.[2] The caudal vertebrae of *Aeolosaurus* and the related genus *Gondwanatitan* share anteriorly-inclined neural spines in the anterior caudal vertebrae.[8] The vertebrae from the middle part of its tail had elongated centra.[9] *Aeolosaurus* had vertebral lateral fossae that resembled shallow depressions.[9] Fossae that similarly resemble shallow depressions are known from *Saltasaurus*, *Alamosaurus*, *Malawisaurus*, and *Gondwanatitan*.[9] Its middle tail vertebrae's neural spines angled anteriorly when the vertebrae are aligned.[9] These vertebrae resemble those of *Cedarosaurus*, *Venenosaurus*, and *Gondwanatitan*.[9] The tail of *Aeolosaurus* was apparently curved strongly downward, a trait likely shared with other members of Aeolosaurini.[10] This curvature would likely have led to the posterior portion of the tail being very low to the ground, though likely not touching it. The curved base of the tail may have enabled the m. caudofemoralis longus, which extended from the femur to the tail vertebrae, to exert more force while retracting the hindlimb.[10]

Aeolosaurus, like many lithostrotian titanosaurs, bore osteoderms.[11] However, its osteoderms were unusual and most closely resemble those of *Mendozasaurus*.[12] As in all osteoderm-bearing titanosaurs, the osteoderms were probably arranged in one or two rows along the flanks.

Classification

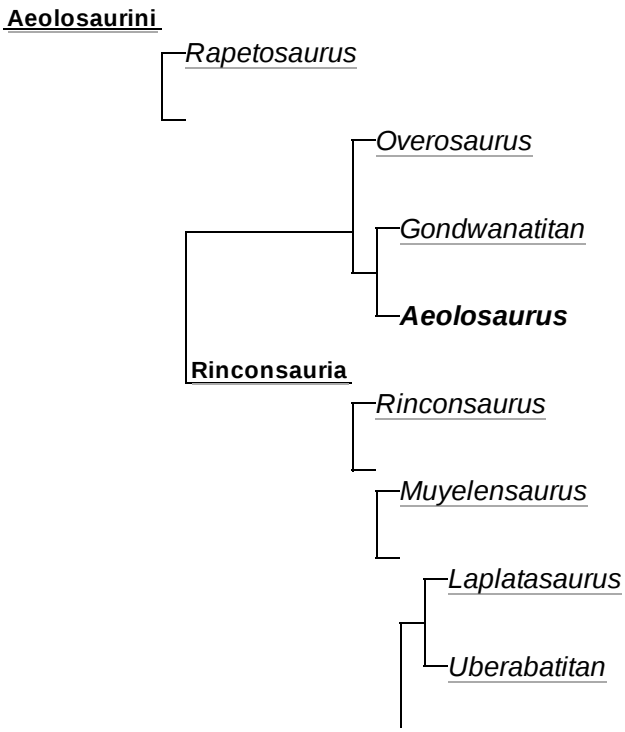
Aeolosaurus is most closely related to the genera *Gondwanatitan* and *Panamericansaurus*.[13][14] Together with *Gondwanatitan*, it defines the clade Aeolosaurini.[5] The two *Aeolosaurus* species from Argentina, *A. rionegrinus* and *A. colhuehuapensis*, appear to be more closely related to each other than to the Brazilian species *A. maximus*.[2]

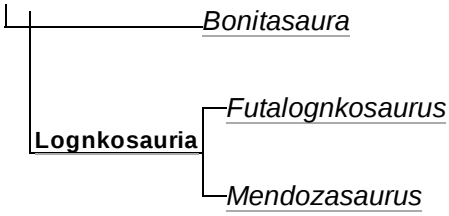
The classification of *Aeolosaurus* and its relatives is heavily based on features of the tail vertebrae, which are the only bones preserved in most aeolosaurs.[2]



Aeolosaurus sp. tail vertebrae

Aeolosaurus has been included in several cladistic analyses. The phylogeny of Aeolosaurini here is based on Gallina and Otero 2015, with the application of clade names according to their phylogenetic definitions.[2][5][14][15][16]





Species

There are currently three named valid species of *Aeolosaurus*, as well as several specimens that have been referred to the genus but not given a species. In addition, *Gondwanatitan faustoi*, the closest known relative of the genus, has been proposed to represent an additional species of *Aeolosaurus*, as *Aeolosaurus faustoi*.[17] However, *Gondwanatitan* is typically considered a distinct genus.[3]

- ***Aeolosaurus rionegrinus*** is the type species of *Aeolosaurus*.[1] It is known from a single specimen, MJG-R 1, that consists of seven caudal vertebrae and many appendicular elements.[4] Its limb bones suggest that it was heavily-built, similar to *Saltasaurus*. It is found in the Angostura Colorada Formation of Argentina.
- ***Aeolosaurus colhuehuapensis*** is known only from 21 caudal vertebrae.[6] It is found in the Lago Colhue Huapi Formation of Argentina.[18]
- ***Aeolosaurus maximus*** is the largest species of *Aeolosaurus*, and is known from an incomplete skeleton including cervical, dorsal, and caudal vertebrae, ribs, and appendicular elements.[2] It was relatively gracile for a titanosaur. It is found in the Adamantina Formation of Brazil.

Aeolosaurus sp. forelimb elements

Another specimen, described in 1993, consists of five tail vertebrae, and some bones from the forelimb and pelvis. Since there are two right ulna (forearm) bones, the specimen must consist of at least two individuals. These bones were also associated with two osteoderms, or bony armor plates, providing evidence that this dinosaur was armored. This specimen is from the Allen Formation of Rio Negro, dating back about 70 to 68 million years ago to the middle Maastrichtian stage. While this specimen bears features that characterize the genus *Aeolosaurus*, it is from a younger time period and shows enough differences that the authors recognized it as a possible second species.[11] Additional material from the same quarry, described in 2013, shows that the quarry contained the remains at least three individuals of *Aeolosaurus*.[19]

Another partial skeleton, including four more tail vertebrae and material from both limbs on the left side of the body, was described in 1997. This was recovered from the Los Alamitos Formation of Rio Negro, which falls between the other two dates. This specimen was also referred to the genus *Aeolosaurus*, but not to the species *A. rionegrinus*, and may represent a third species.[20]

However, since the genus *Aeolosaurus* is not well known, the authors chose not to formally name either of these possible new species. For now, they are both simply known as "*Aeolosaurus* sp." Future discoveries may give scientists more information on variation within the genus, and show that all of the above specimens belong to *A. rionegrinus*, or that they merit being formally named.

A middle caudal vertebra from the Marília Formation, CPP 248, cannot be evaluated for any diagnostic features of the genus *Aeolosaurus*.[3] However, because it clearly does not belong to *Gondwanatitan*, it is most likely that this vertebra represents *Aeolosaurus*, a genus otherwise unknown from the Marília Formation.[2]

Another series of 15 tail vertebrae was assigned to *Aeolosaurus* in the original description, but it was later determined that the series does not belong to this genus, as it lacks several features found in the other specimens of *Aeolosaurus*.[1][11]

Paleoecology

Aeolosaurus lived during the Campanian and Maastrichtian ages of the Late Cretaceous and shared its environment with hadrosaurs.[2][4] The unnamed Allen Formation species of *Aeolosaurus* inhabited an environment that it shared with five other species of titanosaur, including *Rocasaurus muniozi*, as well as hadrosaurs and ankylosaurs.[19]

Aeolosaurus compared to contemporaneous fauna from the **Allen Formation** (*Aeolosaurus* in dark brown)

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